5.7 Rational Exponents

- write expressions with rational exponents in radical form and vice versa
- simplify

For all
$b \in R$
$n \in Z$

$$\sqrt[n]{b} = b^{\frac{1}{n}}$$

Exponential Form	Radical Form
$8^{\frac{1}{3}}$	$\sqrt[3]{8}$
$64^{\frac{1}{2}}$	$\sqrt{64}$
$16^{\frac{1}{4}}$	$\sqrt[4]{16}$
$x^{\frac{1}{5}}$	$\sqrt[5]{x}$
$x^{\frac{3}{4}}$	$\sqrt[4]{x^3}$

$$b^{\frac{m}{n}} = \sqrt[n]{b^m}$$

For all $b \in R$ $(b \neq 0)$ and $m, n \in Z$ $(n > 1)$

Simplified
- no negative exponents
- no fractional exponents in denominator
- not a complex fraction
- index is as low as it can be

Simplify.

$$\sqrt[4]{36x^2}$$

Simplify.

$\sqrt[8]{16}$

$\sqrt[8]{2^4} = 2^{\frac{4}{8}} = 2^{\frac{1}{2}} = \sqrt{2}$

Simplify.

$\sqrt[15]{32}$

$\sqrt[15]{2^5} = 2^{\frac{5}{15}} = 2^{\frac{1}{3}} = \sqrt[3]{2}$

$\sqrt[3]{x^2} \cdot \sqrt{x}$

$x^{\frac{2}{3}} \cdot x^{\frac{1}{2}}$

$x^{\left(\frac{2}{3}+\frac{1}{2}\right)}$ $\frac{4}{6}+\frac{3}{6}$ $= x^{\frac{7}{6}} = \sqrt[6]{x^7}$

$x\sqrt[6]{x}$

$\sqrt[12]{9x^6}$

$\sqrt[12]{3^2x^6}$

$(3^2x^6)^{\frac{1}{12}}$

$3^{\frac{2}{12}} x^{\frac{6}{12}}$

$3^{\frac{1}{6}} x^{\frac{1}{2}}$

$3^{\frac{1}{6}} x^{\frac{3}{6}}$ ← LCDenom

$\sqrt[6]{3x^3}$

$\dfrac{\sqrt[8]{16}}{\sqrt[6]{2}} = \dfrac{\sqrt[8]{2^4}}{\sqrt[6]{2}} = \dfrac{2^{\frac{1}{2}}}{2^{\frac{1}{6}}}$

$2^{\left(\frac{1}{2}-\frac{1}{6}\right)} = 2^{\frac{2}{6}} = 2^{\frac{1}{3}} = \sqrt[3]{2}$

$9^{-\frac{1}{2}} = \dfrac{1}{9^{\frac{1}{2}}} = \dfrac{1}{\sqrt{9}} = \dfrac{1}{3}$

$16^{-\frac{1}{2}} = \dfrac{1}{16^{\frac{1}{2}}} = \dfrac{1}{\sqrt{16}} = \dfrac{1}{4}$

$\dfrac{1}{9^{-\frac{1}{2}}}$

$$\frac{3}{y^{\frac{1}{2}}} \cdot \frac{y^{\frac{1}{2}}}{y^{\frac{1}{2}}} = \frac{3y^{\frac{1}{2}}}{y} = \frac{3\sqrt{y}}{y}$$

HW
p261
21-61odd

$$\frac{3}{\sqrt{y}} \cdot \frac{\sqrt{y}}{\sqrt{y}} = \frac{3\sqrt{y}}{y}$$